SPECIFICATION

Please replace the paragraph starting on page 9, line 21 of the Specification with the following replacement paragraph:

An optical processor for an antenna array 150 shown in FIG. 1 derives its operational characteristics from a pulse generator, such as a traveling-wave FSFC 100. The processor includes an injection source 110 for generating an optical transmit seed signal. The injection source 110 is optically coupled to the FSFC 100. The injection source 110 may use any type of light-emitting source to generate the transmit seed signal. In this embodiment, the injection source includes a laser source 112 and a laser source controller 114. The FSFC 100 includes a frequency-shifting device (such as an AOM 107) and a cavity-length adjustment device (such as a translation stage 109), which is controlled by a scan controller 149. The FSFC 100 may also include a gain medium (not shown). An optical-to-RF signal converter such as a heterodyne detection device 120, is optically coupled to the FSFC 100. The heterodyne detection device 120 includes an output-beam wavelength demultiplexer (such as a diffraction grating 122), a fiber optic array link 124, an optical reference source 121, a reference beam fiber optic link 123, and a photodiode array 126 comprised of a plurality of photodiodes. A transmit/receive coupler array 130 connects the antenna array 150 to the photodiode array 126 and to an RF-to-optical signal converter 142 inside an optical receiver network 140. The RF-to-optical signal converter 142 is coupled to the FSFC 100 via an optical beam combiner 144. The optical receiver network 140 also includes a receive-beam wavelength demultiplexer, such as receiver diffraction grating 146, coupled to the FSFC 100. The receiver diffraction grating 146 is also optically coupled to a receiver 148.

B1

Please replace the paragraph starting on page 10, line 3 of the Specification with the following replacement paragraph:

The laser source 112 may be any type of laser-beam generator that can provide beam intensities sufficient for operation of the processor as described in this application and may include more than one laser. The laser source is preferably a semiconductor laser. The laser source 112 emits an optical transmit seed signal that is coupled into the FSFC 100. For beam-forming applications, it is preferable that the transmit seed signal be a narrow-band signal. It is possible and in some cases preferable for the laser source 112 to emit multiple optical signals, each having a different frequency. Each frequency of the transmit seed signal emitted by the laser source 112 and coupled into the FSFC 100 is ultimately used to control at least one RF beam pattern radiated by the antenna array 150. The multiple optical signals may control multiple beam patterns and/or multiple sub-arrays of the antenna array 150. However, the embodiment of the array processor shown in FIG. 1 is used to describe how the processor functions with respect to a single frequency of light input into the FSFC 100. In this case, the laser source 112 is modulated by a modulator, such as the laser-source controller 114, at a data rate corresponding to an information signal to be transmitted. Various types of modulation may be used to produce a modulated transmit seed signal, such as AM, FM, PAM, PSK, FH, and time-offset modulation.

Please replace the paragraph starting on page 20, line 3 of the Specification with the following replacement paragraph:

A plot of a mode-locked output generated by the sum of ten equal-amplitude modes is shown in FIG. 2, and a plot of a mode-locked output produced by the interference between 50 equal-amplitude modes is illustrated in FIG. 3. Each mode has a frequency that equals the sum of a base frequency f_b and an integer multiple i (i = 1,…,N) of an incremental separation frequency f_i. In the case where the FSFC 100 is the pulse generator used to generate the modes, the base frequency f_b may correspond to the optical transmit seed signal's frequency, and the separation frequency f_i may correspond to the shift frequency f_s of the AOM 107. In this case, the AOM 107 and the injection source 110 function as a frequency selector. In FIG. 2 and FIG. 3, the base and separation frequencies f_b and f_i have relative values of 1000 and .5, respectively, and have units of inverse time scaled by an arbitrary multiplier. The ten modes that comprise the pulses shown in FIG. 2 range in frequency from 1000.5 to 1005. The frequency spectrum occupied by the pulses shown in FIG. 3 includes 50 discreet frequencies in the range of 1000.5 to 1025. The pulses are essentially envelopes that enclose a signal that has a frequency that is approximately the value of f_b. The significance of this example is that it shows that modes can be selected from limited frequency spectrums to produce short time-domain pulses for CIMA.

B3

Please replace the paragraph starting on page 22, line 6 of the Specification with the following replacement paragraph:

FIG. 6 is a plot of the spectral profile of a sequence of modes w(n) having incremental frequency spacing and amplitude tapering toward the edges of the sequence. All of the tapered window-filter techniques reduce sidelobes at the expense of increasing the main-lobe width. For example, the generalized Hanning window can be interpreted as a class of windows obtained as a weighted sum of a rectangular window and shifted versions of the rectangular window. The shifted versions add together to cancel the sidelobe structure at the expense of creating a broader main lobe. Some other types of tapered window sequences used in finite impulse response (FIR) filter design that are also applicable to the present invention include triangular (Bartlett), Hamming, Kaiser, Chebyshev, and Gaussian windows. In the case where the excitation distribution sequence w(n) is controlled within the FSFC 100 (for example, this would be done in an active FSFC 100, which contains a gain medium), a frequency-discrimination device may be used, such as a thin etalon (not shown) or an optical filter (not shown), that provides variable attenuation with respect to wavelength. Also, a spatial filter (not shown) or mask (not shown) may be used inside the cavity 100 to attenuate certain frequencies of light relative to their spatial relationships inside the cavity 100. The optical-to-RF signal converter may use a window filter to taper the optical distribution input into the converter or taper the RF distribution of the RF signal output from the converter. Other window filters such as frequency-selective or spatially selective variable gain or other forms of amplitude control may be applied to signals after being coupled out of the cavity 100. The term "frequency selector" may include any of the types of frequency-domain filters described herein.

E4

Please replace the paragraph starting on page 18, line 17 of the Specification with the following replacement paragraph:

The reference source 121 may include a narrow-band single-frequency optical signal source. This causes the radiative transmit signal S_{TXn} to be incremental in frequency with respect to index n and the shift frequency f_s. This type of radiative transmit signal generates time-domain pulses by utilizing carrier interference multiple access (CIMA), a type of spread spectrum that makes use of interference between multiple carrier signals to create an information signal. This particular type of CIMA is similar to mode locking in that mode-like carrier signals having incremental frequencies are phase locked to produce constructive interference within a given time interval, resulting in sinc-type pulses. The FSFC (100) is one type of pulse generator that may be employed by the invention. The controller 114 is one type of modulator that may be used. The AOM 107 and injection source 110, as well as any filters (not shown), function as a frequency selector. Although the system in FIG. 1 is shown as a preferred embodiment of the invention for generating CIMA signals, other types of RF systems as well as optical systems may be used to generate CIMA signals.

E5

Version with markings to show changes made to the Claims

30. A multicarrier-signal generator including:

a pulse generator capable of generating a plurality of periodic pulses, the periodic pulses having at least one pulse period and a frequency spectrum comprising a plurality of carrier signals having equally spaced frequencies, and

a frequency selector coupled to the pulse generator, the frequency selector capable of selecting [a] the plurality of [the] carrier signals [with respect to] to be within at least one predetermined frequency band.

31. A multicarrier-signal generator including:

a pulse generator capable of generating a plurality of periodic pulses, the periodic pulses having at least one pulse period and a frequency spectrum comprising a plurality of carrier signals having equally spaced frequencies with a frequency spacing that is a function of the at least one pulse period,

a modulator coupled to the pulse generator, the modulator adapted to modulate at least one information signal onto at least one of the periodic pulses, and

a frequency selector coupled to at least one of the modulator and the pulse generator, the frequency selector capable of selecting [a] the plurality of [the] carrier signals [with respect to] to be within at least one predetermined frequency band.

32. A method of generating a multicarrier signal including:

providing for generating a plurality of information-modulated periodic pulses [wherein the] including generating a plurality of unmodulated pulses [have] having at least one pulse period and a frequency spectrum comprising a plurality of equally spaced carrier signals, the information-modulated periodic pulses having at least one of a set of signal characteristics that is a function of at least one information signal, the set of signal characteristics including amplitude, phase, time, and frequency, and

providing for selecting [a] the plurality of [the] carrier signals [with respect to] to be within at least one predetermined frequency band.

33. A method of generating a multicarrier signal including:

providing for generating a plurality of periodic pulses wherein the <u>periodic</u> pulses have <u>at least one pulse period and</u> a frequency spectrum comprising a plurality of carrier signals having equally spaced frequencies, and

providing for modulating the <u>periodic</u> pulses with at least one information signal <u>to generate a plurality of information-modulated periodic pulses</u>, the information-modulated <u>periodic</u> pulses having at least one of a set of signal characteristics that is a function of the information signal, the set of signal characteristics including amplitude, phase, and frequency.

34. The multicarrier-signal generator recited in claim 30 wherein the pulse generator includes a modulator adapted to modulate <u>at least one of a set of signals, including</u> [a] <u>the</u> plurality of [the] carrier signals <u>and the plurality of pulses,</u> with at least one information signal.

35. The multicarrier-signal generator recited in claim 30 wherein the pulse generator includes a modulator adapted to modulate [a] <u>the</u> plurality of [the] <u>periodic</u> pulses with at least one <u>coded</u> information signal.

36. The multicarrier-signal generator recited in claim 30 wherein the pulse generator includes a modulator adapted to modulate the [carriers] <u>carrier signals</u> with information symbols having durations of up to the pulse period of the periodic pulses.

38. The multicarrier-signal generator recited in claim 30 wherein the pulse generator includes a coder and a modulator, the coder adapted to encode information signals, and the modulator adapted to modulate at least one coded information signal onto at least one of a set of signals, including the plurality of <u>periodic</u> pulses and the plurality of carrier signals.

39. The multicarrier-signal generator recited in claim 30 wherein the pulse generator includes a carrier generator and a combiner, the carrier generator adapted to generate the plurality of carrier signals and the combiner adapted to combine the plurality of carrier signals to generate the <u>periodic</u> pulses.

43. The multicarrier-signal generator recited in claim 42 wherein the at least one of the pulse generator and the frequency selector is adapted to provide [a] <u>the</u> predetermined frequency-versus-amplitude window belonging to any of a set of tapered window

functions, including Hanning, Hamming, Gaussian, triangular, Bartlett, Kaiser, and Chebyshev functions.

44. The multicarrier-signal generator recited in claim 30 wherein the pulse generator is adapted to provide an identical time-dependent frequency variation to each of the [carriers] carrier signals.
52. The multicarrier-signal generator recited in claim 31 wherein the modulator is adapted to modulate the [carriers] carrier signals with information symbols having durations of up to the pulse period of the periodic pulses.
54. The multicarrier-signal generator recited in claim 31 further including a coder adapted to encode information signals prior to modulation to generate a plurality of coded information signals, the modulator being adapted to modulate the coded information signals onto at least one of a set of signals, including the plurality of periodic pulses and the plurality of carrier signals.
55. The multicarrier-signal generator recited in claim 31 wherein the pulse generator includes a carrier generator adapted to generate the plurality of [carriers] carrier signals, and a combiner adapted to combine the plurality of carrier signals to generate the periodic pulses.
60. The multicarrier-signal generator recited in claim 31 wherein the pulse generator is adapted to provide an identical time-dependent frequency variation to each of the [carriers] carrier signals.
66. The method of generating a multicarrier signal recited in claim 32 wherein providing for generating [a] the plurality of information-modulated periodic pulses includes providing for modulating each of the carrier signals with the at least one information signal.
67. The method of generating a multicarrier signal recited in claim 32 wherein providing for generating [a] the plurality of information-modulated periodic pulses includes providing for modulating one or more superpositions of the carrier signals with the at least one information signal.
68. The method of generating a multicarrier signal recited in claim 32 wherein providing for generating [a] the plurality of information-modulated periodic pulses includes

providing for modulating the [carriers] carrier signals with information symbols having durations of up to the pulse period of the periodic pulses.

69. The method of generating a multicarrier signal recited in claim 32 wherein providing for generating [a] the plurality of information-modulated periodic pulses includes providing for performing at least one of a set of modulation types, including amplitude modulation, phase modulation, time-offset modulation, and frequency modulation.

70. The method of generating a multicarrier signal recited in claim 32 further including providing for encoding information signals to generate a plurality of coded information signals and providing for modulating the coded information signals onto at least one of a set of signals, including the plurality of periodic pulses and the plurality of carrier signals.

71. The method of generating a multicarrier signal recited in claim 32 wherein providing for generating a plurality of information-modulated periodic pulses includes providing for generating the plurality of [carriers] carrier signals, and providing for combining the plurality of carrier signals to generate the periodic pulses.

74. The method of generating a multicarrier signal recited in claim 32 wherein at least one of providing for generating [a] the plurality of information-modulated periodic pulses and providing for selecting [a] the plurality of the carrier signals includes providing for applying a predetermined frequency-domain window to the carrier signals.

75. The method of generating a multicarrier signal recited in claim 32 wherein at least one of providing for generating [a] the plurality of information-modulated periodic pulses and providing for selecting [a] the plurality of the carrier signals includes providing for applying a predetermined frequency-domain window to the [carriers] carrier signals, the frequency-domain window belonging to any of a set of tapered window functions, including Hanning, Hamming, Gaussian, triangular, Bartlett, Kaiser, and Chebyshev functions.

76. The method of generating a multicarrier signal recited in claim 32 wherein providing for generating [a] the plurality of information-modulated periodic pulses includes

providing for applying an identical time-dependent frequency variation to each of the [carriers] carrier signals.

77. The method of generating a multicarrier signal recited in claim 32 wherein providing for generating [a] the plurality of information-modulated periodic pulses includes providing for performing multiple access with respect to at least one of a set of multiple-access protocols, the set including frequency division multiple access, time division multiple access, and code division multiple access.

78. The method of generating a multicarrier signal recited in claim 32 wherein at least one of providing for generating [a] the plurality of information-modulated periodic pulses and providing for selecting [a] the plurality of the carrier signals includes providing for applying at least one set of time offsets to the carrier signals.

79. The method of generating a multicarrier signal recited in claim 32 wherein providing for selecting [a] the plurality of the carrier signals includes providing for selecting a predetermined set of carrier frequencies allocated to a particular user in a communication system.

82. The method of generating a multicarrier signal recited in claim 33 wherein providing for modulating the periodic pulses with at least one information signal includes providing for modulating each of the carrier signals with the at least one information signal.

83. The method of generating a multicarrier signal recited in claim 33 providing for modulating the periodic pulses with at least one information signal includes providing for modulating one or more superpositions of the carrier signals with the at least one information signal.

84. The method of generating a multicarrier signal recited in claim 33 wherein providing for modulating the periodic pulses with at least one information signal includes providing for modulating the [carriers] carrier signals with information symbols having durations of up to the pulse period of the periodic pulses.

85. The method of generating a multicarrier signal recited in claim 33 providing for modulating the periodic pulses with at least one information signal includes providing for performing at least one of a set of modulation types, including amplitude modulation, phase modulation, time-offset modulation, and frequency modulation.

86. The method of generating a multicarrier signal recited in claim 33 further including providing for encoding the at least one information signal to generate a plurality of coded information signals prior to providing for modulating the coded information signals onto at least one of a set of signals, including the plurality of periodic pulses and the plurality of carrier signals.
87. The method of generating a multicarrier signal recited in claim 33 wherein providing for generating [a] the plurality of periodic pulses includes providing for generating the plurality of [carriers] carrier signals, and providing for combining the plurality of carrier signals to generate the periodic pulses.
88. The method of generating a multicarrier signal recited in claim 33 wherein providing for generating [a] the plurality of periodic pulses includes providing for generating pulses having carrier signals that include at least one of a set of frequencies, including intermediate frequencies, radio frequencies, and optical frequencies.
89. The method of generating a multicarrier signal recited in claim 33 wherein providing for generating [a] the plurality of periodic pulses includes providing for generating a continuous train of pulses.
90. The method of generating a multicarrier signal recited in claim 33 wherein at least one of providing for generating [a] the plurality of periodic pulses and providing for modulating the periodic pulses includes providing for applying a predetermined frequency-domain window to the carrier signals.
91. The method of generating a multicarrier signal recited in claim 33 wherein at least one of providing for generating [a] the plurality of periodic pulses and providing for modulating the periodic pulses includes providing for applying a predetermined frequency-domain window to the [carriers] carrier signals, the frequency-domain window belonging to any of a set of tapered window functions, including Hanning, Hamming, Gaussian, triangular, Bartlett, Kaiser, and Chebyshev functions.
92. The method of generating a multicarrier signal recited in claim 33 wherein providing for generating [a] the plurality of periodic pulses includes providing for applying an identical time-dependent frequency variation to each of the [carriers] carrier signals.
93. The method of generating a multicarrier signal recited in claim 33 wherein providing for generating [a] the plurality of periodic pulses includes providing for performing

multiple access with respect to at least one of a set of multiple-access protocols, the set including frequency division multiple access, time division multiple access, and code division multiple access.

94. The method of generating a multicarrier signal recited in claim 33 wherein at least one of providing for generating [a] the plurality of information-modulated periodic pulses and providing for modulating the periodic pulses includes providing for applying at least one set of time offsets to the carrier signals.

Very respectfully,

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